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Neutral Uranium(VI) Sulfido Compound Isolated and Characterized for the First Time

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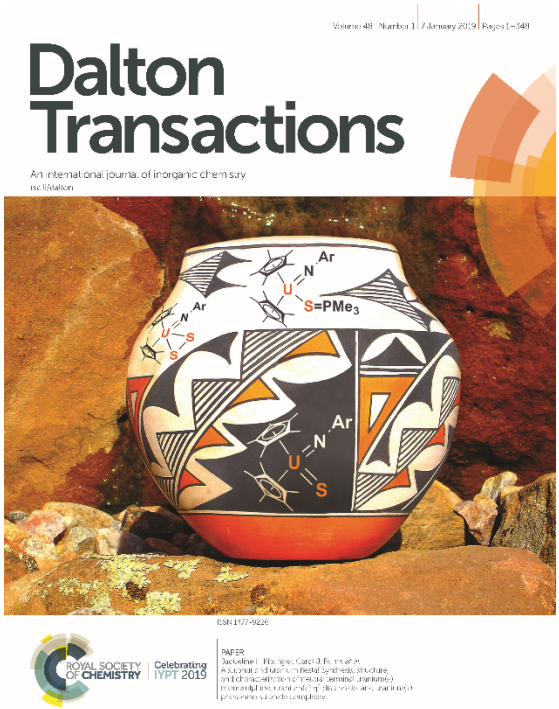
The topic of uranium element multiple bonding has long been a subject of interest to actinide scientists. While uranyl (UO_2^{2+}) is the most common form of uranium in nature, other uranium multiple bonded species are difficult to synthesize. An important interaction that has been largely elusive for actinide chemists is uranium sulfur double bonds, known as a uranium sulfido (U=S). These linkages have particular relevance to actinide-lanthanide separations, where the "softer" sulfur atom allows for the removal of certain heavy elements from others. In molecular chemistry, there are few uranium sulfidos that have been synthesized, but these compounds are all anionic which limits their utility in understanding the uranium–sulfur double bond. This has changed with a recent report by Justin K. Pagano (Seaborg Postdoctoral Fellow, C–IIAC), David S. J. Arney (formerly C division), Brian L. Scott (MPA-11), David E. Morris (C–IIAC), Jaqueline L. Kiplinger (C–IIAC), and Carol J. Burns (DDSTE) who have synthesized several new compounds with uranium–sulfur bonds including a neutral uranium(VI) compound with a terminal uranium sulfido ligand.



The cover art highlights the new uranium sulfido and other molecules made in this study on a New Mexican Acoma pot, a favorite of Professor Richard A. Andersen (UC-Berkeley).

The uranium–sulfur bond of the terminal sulfido compound was found to be the shortest structurally authenticated, signaling that this was indeed a true uranium–sulfur double bond. UV–visible spectroscopy showed that the interaction between the "soft" sulfur and the "hard" uranium atom is expectedly much weaker than that of a uranium imido (U=NR) species which contains a more favorable "hard-hard" match. This suggests that U=S bonds may be very reactive and allows for a better understanding of how this linkage may be found in natural settings and taken advantage of in separations technology and other chemical applications.

This research was published on line in *Dalton Transactions* in a special issue honoring Richard A. Andersen's 75th birthday (Reference: "It's A Sulfur and Uranium Fiesta! Synthesis, Structure, and Characterization of Neutral Terminal Uranium(VI) Monosulphide, Uranium(VI) η^2-Disulphide, and Uranium(IV) Phosphine Sulphide Complexes," *Dalton Transactions*, **2019**, *48*, 50-57). Richard A. Andersen has long been a pioneer in the field of molecular *f*-element chemistry, and *Dalton Transactions* is a leading international journal featuring cutting-edge research in inorganic chemistry. This research supports the Laboratory's Plutonium Science and

Research Strategy and missions in Energy Security and Materials for the Future. The research was supported by Los Alamos National Laboratory Directed Research and Development program, the Glenn T. Seaborg Institute for Transactinium Science, and the DOE Office of Science Heavy Element Chemistry Program. Jim Cruz (CPA-CAS) is gratefully acknowledged for help with designing the cover art.